

REMARKS

Claims 1, 5, 9, and 11 were rejected under 35 U.S.C. §102(e) as being unpatentable over McCanne (U.S. Patent No. 6,611,872 B1).

Claims 2-4, 6-8, 10, 12, and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over McCanne in view of Ylonen et al. (U.S. Patent No. 6,438,612 B1).

Independent claims 1, 5, and 9 are now amended.

The rejection of claims 1-13 is being herein respectfully traversed for the following reasons:

Regarding independent claims 1, 5, and 9:

McCanne discloses a plurality of overlay routers connected with a virtual network (overlay network), wherein an end-to-end multicast communication is realized through the overlay network.

Such overlay routers can exploit native multicasting for communications therebetween.

Summary of such an end-to-end multicast communication including native multicasting will be briefly described referring to the attached Fig.1 showing relevant portions of McCanne's Fig.6. It is to be noted that overlay routers OR1-OR4 in Fig.1 respectively correspond to MediaBridge computers M2, M3, M4, and M6 in McCanne's Fig.6.

The overlay routers OR1 and OR2 respectively determine native multicast addresses (Ndst=a and Ndst=b) for multicast transit networks (1 and 2) according to a destination overlay multicast address (Odst=A) designated by a transmitting source S.

As an entrance to the overlay network, the overlay router OR1 adds the overlay multicast address Odst=A after a native IP header including native multicast address Ndst=a.

As an exit from the ovelay network, an overlay router OR3 transfers a packet to a destination R1 according to the overlay multicast address Odst=A. Similarly, an overlay router OR4 transfers the packet to destinations R2 and R3 according to the overlay multicast address Odst=A.

McCanne fails to disclose a virtual relaying structure with which a virtual network is preliminarily associated as claimed in amended independent claims 1, 5, and 9.

Therefore, the following differences can be found between McCanne's system and the present invention.

While McCanne's overlay router associates overlay multicast addresses with native multicast addresses, the relaying apparatus of the present invention associates virtual networks with virtual relaying structures.

This difference between McCanne's overlay router and the present invention will be described in more detail, referring to Figs.2 and 3 attached hereto.

Fig.2 schematically shows a state of multicast communication according to McCanne. When a sender S1 transmits data to a receiver R1 by designating an overlay multicast addresses Odst=MC1, overlay routers OR's multicast the data within the native network using a native multicast address Ndst=mc1 associated with Odst=MC1. Similarly, when a sender S2 transmits data to a receiver R2 by designating an overlay multicast address Odst=MC2, the overlay routers OR's multicast the data within the native network using native multicast address Ndst=mc2.

It is to be noted that the overlay multicast addresses and the native multicast addresses are associated on a one-on-one basis, namely, each of the overlay multicast addresses (e.g.

"MC1" and "MC2") can be associated with only one of the native multicast addresses (e.g. "mc1" or "mc2"). Therefore, the number of IP addresses available for the overlay multicast addresses is limited to the number of the native multicast addresses. This means that the size of the address space for the overlay multicast addresses is small.

Fig.3 schematically shows a state of communication according to the present invention. It is to be noted that ROUTERs represent the claimed relaying apparatus, virtual routers VR1 and VR2 represent the claimed virtual relaying structure, and tunnels T1 and T2 represent the claimed virtual link.

According to the present invention, a multicast address to be set in a control packet is predetermined per virtual network. Therefore, the tunnel T1 is established between the ROUTER's using a multicast address "mc1" associated with a virtual network of VPNID=1 as predetermined. Also, the tunnel T2 is established using a multicast address "mc2" associated with a virtual network of VPNID=2.

Since the virtual routers VR1 and VR2 are independently operable per virtual network, the virtual routers VR1 handle communication between senders S1, S2 and receivers R1, R2 belonging to the virtual network VPNID=1, while the virtual routers VR2 handle communication between a sender S3 and a receiver R3 belonging to the virtual network VPNID=2. The tunnels T1 and T2 respectively correspond to the virtual routers V1 and V2 associated with the virtual networks VPNID=1 and VPNID=2.

Namely, in the present invention as shown in Fig.3, a plurality of addresses (e.g. "MC1" and "MC2") can be associated with a single native multicast address (e.g. "mc1"). Also, the same address (e.g. "MC1") can be associated with a plurality of native multicast addresses (e.g. "mc1" and "mc2").

As a result, packets of different multicast addresses "MC1" and "MC2" respectively transmitted by the senders S1 and S2 can be delivered to the receivers R1 and R2 through the same tunnel T1 since the senders S1, S2 and the receivers R1, R2 belong to the virtual network VPNID=1.

Also, even if the same destination address "MC1" is used by the senders S1 and S3, the transmitted packets can be delivered to the different receivers R1 and R3, respectively through tunnels T1 and T2, since the sender S1 and R1 belong to the virtual network VPNID=1 while the sender S3 and R3 belong to the virtual network VPNID=2.

This means that each of the tunnels T1 and T2 in Fig.3 can handle all packets addressed to the entire IP address space (0.0.0.0-255.255.255.255).

Therefore, the present invention can use a larger address space compared to that of McCanne's overlay network.

Accordingly, independent claims 1, 5 and 9 are believed to be patentably distinguished over McCanne under 35 U.S.C. §102(e).

Regarding claim 11 depending from claim 9:

This claim is believed to be patentably distinguished over McCanne under 35 U.S.C. §102(e) at least because of its dependency from independent claim 9.

Regarding claims 2-4, 6-8, 10, 12, and 13:

Those claims are believed to be patentable over McCanne in view of Ylonen et al. at least because of their dependency from respective independent claims 1, 5, and 9.

In view of the remarks set forth above, this application is in condition for allowance which action is respectfully requested. However, if for any reason the Examiner should consider this application not to be in condition for allowance, the Examiner is respectfully requested to telephone the undersigned attorney at the number listed below prior to issuing a further Action.

Any fee due with this paper may be charged to Deposit Account No. 50-1290.

Respectfully submitted,

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